Patent Application of

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for

TITLE: A COMBINATION SMOKE ALARM AND WIRELESS LOCATION DEVICE

FEDERALLY SPONSORED RESEARCH Not Applicable

SEQUENCE LISTING OR PROGRAM Not Applicable

CROSS REFERENCE TO RELATED APPLICATIONS

This application is entitled to the benefit of Provisional Patent Application Ser. No. 60/416,970, filed October 8, 2002, and Provisional Patent Application Ser. No. 60/416,971, filed October 8, 2002.

BACKGROUND OF THE INVENTION

1. Field of the Invention

(0001) The present invention relates generally to smoke alarms and wireless telecommunications systems. More specifically, the present invention provides a combination device and method for locating a smoke alarm utilizing E-911 wireless telecommunication location systems.

2. Description of Prior Art

a. Prior Art Smoke Alarm Devices and Systems

(0002) Smoke alarm devices and systems are valuable fire protection tools that save life and property. Detecting smoke at the earliest stages of a fire, alerting building occupants for rapid evacuation, and notifying emergency response resources of the fire are key factors for any general fire safety plan. However, failure of any one of the key factors dramatically increases the fire

danger. In sum, in building fire scenarios, reduced physical injury, reduced loss of life, and reduced property damaged are all dependent upon building occupants safely evacuating a burning building, and quickly contacting emergency response personnel to help render aid and extinguish the fire.

(0003) Many configurations of smoke alarm devices and systems exist in the prior art. Self-contained, independent smoke alarm units provide either photoelectric or ionization sensors or both to rapidly detect smoke, provide AC and/or DC power sources, and provide an audible alarm horn and/or visual alarm strobe light to alert building occupants of a potential fire. For example, the First Alert SA302 smoke alarm provides both photoelectric and ionization sensors in one unit. In addition, the Gentex DL2220 smoke alarm features an ADA-compliant 90 dB audible alarm horn and 177 candela strobe light for hearing impaired persons.

(0004) Although self-contained units provide many innovative features, many drawbacks exist. For instance, in larger buildings containing many rooms or multiple levels, even when equipped with multiple self-contained smoke alarm units, a smoke alarm may detect smoke and fire in remote or unoccupied areas for unknown periods of time before the occupants are alerted to the fire, allowing the fire to spread. Furthermore, physically-challenged, intoxicated, or sleeping occupants may not hear or otherwise respond to the activated smoke alarm before being overcome by smoke inhalation. These drawbacks substantially increase the fire danger to occupants, property, and emergency response personnel. Thus, self-contained smoke alarms have serious limitations relating to alerting building occupants, who are in turn responsible for contacting emergency response personnel.

(0005) Recognizing the above and other shortcomings of self-contained smoke alarms, federal, state, and local fire code may require that newer residences install multiple self-contained smoke alarms equipped with hard-wired interconnection terminals for multiple smoke alarm activation. The interconnection terminals allow multiple smoke alarms to be interconnected within a building, so when any one of the interconnected smoke alarm senses smoke, other interconnected alarm are activated. For example, Tanguay and Kondziolka (U.S. Pat. No. 6,362,743) provides a smoke alarm with an interconnection terminal. Additionally, the First Alert SA4121 smoke alarm provides interconnection terminals.

(0006) Smoke alarms providing wireless interconnections operate on a principle similar to hard-wired interconnected smoke alarms. However, wireless smoke alarms often employ short-

range transceivers for achieving interconnection with other smoke alarms. For instance, Morris (U.S. Pat. No. 5,587,805) provides a multiple alert smoke alarm in which two or more smoke alarms containing wireless FM transmitters provide multiple alarm activation. Additionally, Curl (U.S. Pat. No. 5,019,805) provides a smoke alarm featuring both interconnection via AC power line carrier signal and interconnection via wireless signal means.

(0007) Despite solving some of the problems of self-contained smoke alarms, drawbacks exist with the above-mentioned interconnected smoke alarms. For example, although interconnected smoke alarms may alert building occupants to fires in remote or unoccupied areas, if the building is unoccupied or vacant, the fire will go undetected until the fire spreads to out of control. Only in the event neighbors or other observers haphazardly notice the burning building will emergency response personnel be contacted. This scenario may cause the fire to spread to adjacent property, or, in rural settings, cause a wildfire, increasing the danger to public safety, property, and emergency response personnel.

(0008) Other hard-wired or wireless interconnected smoke alarms are part of residential or commercial building security systems, which are primarily designed for intrusion detection and home automation. For example, the NAPCO Gemini system provides a modular residential security system, consisting of a separate wall-mounted control panel, keypad, wireless receiver, and various wireless security sensors, including wireless smoke alarms. These systems may contain a telephone auto-dialer connected to a "wireline" telephone, which then automatically notifies a commercial security monitoring service center upon activation.

(0009) The shortcomings of integrated security systems containing smoke alarms are numerous. First, such systems are cost prohibitive for fire protection, due to the numerous non-essential components and sizable installation costs. Also, integrated security systems require skilled technicians to install, test, and maintain the entire system. Second, in addition to the complexity and sizable up-front costs, integrated security systems may not include smoke alarms with the basic security system package. Furthermore, integrated security systems often require an additional telephone line, and utilize off-site commercial security monitoring services, requiring additional monthly service fees.

(0010) A further limitation of all of the above-mentioned smoke alarm devices and systems, is that they are not designed for installation in building structures undergoing construction, or an

effective means for fire monitoring in vacant residences or commercial buildings. In most residential and commercial buildings under construction, there is no means for fire monitoring, and registered street address. The workers on the construction site and persons in the immediate vicinity are the primary means for monitoring potential fires. Because such buildings may be vacant during the off-work hours, a potential fire may burn unnoticed before it rages out of control, causing increased fire damage to the said building, increased damage to adjacent properties, and increased danger to emergency response personnel.

(0011) Another key drawback of existing self-contained and interconnected smoke alarms is the lack of effective means for automatically notifying emergency response resources of the specific location of the fire emergency. Having direct contact with a public 911 dispatch center, often referred to as a Public Safety Answering Point ("PSAP"), is one of the key factors in overall fire safety.

(0012) For example, during a fire emergency, evacuating building occupants are faced with sudden conflicting decisions, which include immediately evacuating the burning building, helping others to evacuate safely, gathering valuable property, or calling 911 to report the fire and summon emergency response resources.

(0013) In most cases, building occupants calling 911 in a fire emergency will use a conventional wireline telephone or a mobile cellular telephone to call 911. But oftentimes these telephones are located inside of the burning building that the occupant is attempting to evacuate. The main drawback is that an occupant who is attempting to use a telephone will be in a heightened state of anxiety and confusion, so spending time locating a telephone, dialing the number, waiting for a call connection, and verbally articulating the nature of the emergency and other detailed information to a 911 dispatcher can waste critical evacuation time. These complexities place children, the elderly, and the handicapped at high risk.

(0014) Therefore, a need exists to provide a smoke alarm that automatically notifies PSAP's and emergency response resources, and automatically determines the geographic location of the smoke detection alarm. A smoke alarm combined with these novel features will exponentially increase fire safety for people and property.

b. Prior art Wireless Telecommunication Systems, m bile cellular telephones, and emergency 911 systems.

(0015) The existence of wireless telecommunications network systems, often referred to as cellular networks, along with mobile cellular telephones, are well known in the prior art. Aside from being a revolutionary innovation for mobile voice and data communications, many other uses exist, such as determining the geographic location of a mobile cellular telephone. Wireless location is important for a wide-range of applications including telematics, mapping and direction finding, and emergency services.

(0016) Due to a dramatic increase in 911 calls originating from mobile cellular telephones, wireline E-911 needed to be modified to provide a callback number, fixed address and/or geographic location information of mobile cellular telephone. Although the majority of wireline telephones in the United States have E-911 capabilities, mobile cellular telephones do not.

(0017) Recognizing the importance of wireless location for public safety, in 1997 the Federal Communications Commission ("FCC") enacted regulatory mandates requiring wireless telecommunications carriers to upgrade and modify their wireless network infrastructure and associated PSAP equipment, and make appropriate upgrades to mobile cellular telephones. These combined efforts would create wireless telecommunications location systems ("WTLS"), which comprises a wireless telecommunications infrastructure, a PSAP, and mobile cellular telephones. The WTLS allows PSAP's and emergency response authorities to automatically determine the geographic location of a mobile cellular telephone, or track its movements during emergency calls to 911.

(0018) Accordingly, a new wireless location concept, called wireless Enhanced 911 ("E-911") service is being deployed nationwide. Aside from the wireless network upgrades cited below, a PSAP is equipped with a modified Geographic Information System ("GIS") that displays city or county maps and other information, to automatically pinpoint the geographic location of the wireless 911 caller. The PSAP personnel may then dispatch appropriate emergency response personnel to the location of the wireless 911 caller. Wireless E-911 is designed to save lives by reducing the response time and increasing the accuracy of emergency response resources responding to emergency calls. A E-911 wireless location system is disclosed in Kovach, Jr., et al. (U.S. Pat. No. 6,317,604).

(0019) Numerous wireless E-911 location concepts exist in the prior art to achieve WTLS capabilities. The numerous concepts include measuring the time difference of arrival and angle of

arrival of signals transmitted from mobile cellular telephones to base station ("BS") antennas. These concepts generally require a plurality of BS antennas to "triangulate" the signal transmission to determine the geographic location. These concepts operate best when there is a high concentration of BS antenna sites. Otherwise, increasing wireless transceiver amplifier output, or other supplemental means may be needed. A wireless location concept similar to this is disclosed by Stilp (U.S. Pat. No. 6,184,829). These wireless location concepts are governed by the FCC E-911 Phase II network-based regulatory mandate requiring a WTLS to locate an E-911 caller within 100 meters for 67% of calls, and/or within 300 meters for 95% of the calls.

(0020) Another concept existing in the prior art integrates a Global Positioning System ("GPS") receiver into a mobile cellular telephone, which provides an alternate means for location determination. GPS is a popular satellite-based navigation system that provides coded satellite signals that are processed in a GPS receiver to yield the position and velocity of the receiving unit. This location concept generally requires the line-of-sight signal transmission of a plurality of GPS satellites to determine the location coordinates of the GPS receiver. A wireless location concept incorporating GPS and WTLS is disclosed by Soliman (U.S. Pat. No. 6,353,412). This location concept is governed by the FCC's E-911 Phase II handset-based regulatory mandate requiring a location accuracy within 50 meters for 67% of the calls, and/or within 150 meters for 95% of the calls.

(0021) Hybrid locations concepts that combine the above-stated network and handset-based locations concepts exist to reduce the number of BS antenna sites and GPS satellites needed to locate a mobile cellular telephone. These hybrid location concepts may utilize augmented GPS (e.g., assisted GPS, differential GPS), or synchronize the GPS satellites and WTLS BS sites, offering a faster location process. A similar wireless location concept is disclosed by Jolley, et al. (U.S. Pat. No. 6,323,803). Hybrid location concepts may exceed FCC E-911 regulatory mandates by increasing location accuracy and reducing location determination time.

(0022) Certain basic technical aspects have an essential role in WTLS. Generally, air interface protocols (e.g., TDMA, CDMA, GSM, GPRS, AMPS, AMPS, N-AMPS) and relative frequencies operate in conjunction with a wireless telecommunications transceiver ("WTT") – an essential component of a mobile cellular telephone – to transmit signals over the WTLS for location determination. All air interface protocols primarily utilize two types of "channels" for wireless

signal transmission.

(0023) The first type is a control channel, which is typically used for transmitting general identifying information pertaining to the wireless transceiver transmitting the signal. The second type is a voice channel, used primarily for voice communications. Because a voice channel typically does not provide WTT identification information, control channels are often used for wireless location purposes.

(0024) In addition, the latest WTT technology allows a mobile cellular telephone to contain a fully integrated "system on a chip." For example, a WTT may be a dual-band and/or dual-mode (e.g., GSM/GPRS) to optimize voice communications, text messaging (i.e., Short Message Service ("SMS")), and Multi-Media Service ("MMS"), and contain on-chip memory capabilities. Furthermore, the latest Personal Digital Assistants ("PDA's") contain WTT's for mobile cellular telephone functionality. PDA's may also integrate wireless local-area network ("W-LAN") modules for wireless data communications with other PDA's or personal computers.

(0025) Additional FCC regulations include providing wireless "priority access" service to federal, state, and local public safety and emergency response personnel utilizing mobile cellular telephones. Wireless priority access service provides public safety authorities priority access on wireless telecommunications network systems during widespread emergencies, when the number of calls exceeds the system call capacity. Priority access service could also provide benefits for E-911 location services.

(0026) A shortcoming of the aforementioned wireless location concepts is that they are primarily designed for determining the geographic location of voice-only mobile cellular telephones. The intended use of wireless E-911 location involves the user to manually entering the "9-1-1" numeric sequence or some variation into the cellular handset keypad, thereby contacting a PSAP to report the emergency. Once a connection is made, the user must then verbally articulate the nature of the emergency to a 911 dispatcher. Although mobile cellular telephones are an important tool for general safety and emergency reporting, they still require a human user to operate, and are not specially designed for fire safety.

(0027) Another drawback is that in order to utilize E-911 emergency location services, a user must first purchase or acquire a non-operational mobile cellular telephone, and then enter into a service contract with a wireless telecommunications carrier, which requires an activation fee and

monthly service fee. To help alleviate this problem, the FCC issued an order entitled, "Enhanced 911 Emergency Calling Use of Non-initialized Wireless Phones," which provides for "911 only" mobile cellular telephones to have basic wireless E-911 functionality without having to enter into a service contract with a wireless carrier and pay an activation fee. However, these mobile cellular telephones are not specialized for fire safety.

(0028) As described above, prior art smoke alarms are primarily used to detect smoke and alert building occupants with an audible or visual alarm, but provide neither a novel means for automatic and direct contact to a PSAP and emergency response resources, nor a novel means for automatic location determination. The prior art also requires that evacuating building occupants or bystanders use voice-only wireline telephones or mobile cellular telephones to contact a PSAP to report a fire emergency.

(0029) Therefore, in light of the foregoing disadvantages inherent in prior art smoke alarms, a need exists for a new and improved combination smoke detection device that automatically detects fire emergencies, that automatically determines the geographic location of the fire emergency, and automatically dispatches emergency response resources to the fire emergency location.

SUMMARY OF THE INVENTION

(0030) The present invention, the Combination Smoke Alarm and Wireless Location Device, provides a novel and innovative device and method to quickly, efficiently, and cost effectively detect the presence of smoke, alert building occupants of the impending fire emergency, and transmit emergency identification data signals via the WTLS (based on the aforementioned network, handset, or hybrid location concepts) to provide the geographic location of the fire emergency, and further dispatching emergency response resources to the fire emergency location.

(0031) Therefore, the main object of the present device embodiments is a integrated unit which interfaces a WTT module with a smoke alarm, such that when the smoke alarm is activated by the presence of smoke, the WTT module is activated, automatically transmitting stored emergency identification data via the WTLS to a PSAP, thereby summoning emergency responses to the geographic location of the fire emergency.

(0032) An inventive feature of the preferred embodiment, which provides advantages over other smoke alarms in the prior art, is the WTT module and integrated memory containing

preprogrammed or predetermined emergency identification data. The WTT module and emergency identification data will allow direct wireless access to a public 911dispatch center or PSAP. Under current FCC regulations, a carrier is precluded from requiring a prior service or activation contract or charging monthly fees for "911-only" wireless telecommunications devices. The said emergency identification data may be preprogrammed and stored in the WTT module at either the factory-level, carrier-level, or at the point of sale.

(0033) Advantages over prior art smoke alarms include the following:

- Reduces the risk of physical injury by allowing alerted building occupants safe and expedient evacuation, without having the concern or confusion of immediately locating a telephone to call 911 to report the fire incident.
- Relays accurate information directly to a PSAP at the time the smoke is detected, reducing response time and injury to emergency response personnel.
- Provides fire protection to building structures that are unoccupied, vacant, undergoing construction, or without wireline telephone service.
- Provides extended protection to residential buildings housing at-risk persons including the elderly, handicapped, and hearing impaired.

(0034) Although this Summary and the Description below contain many specifics, these should not be construed as limitations on the scope of the invention, but rather an exemplification of embodiments thereof. Accordingly, those skilled in the art will appreciate that this novel conception, upon which this disclosure is based, may be utilized as a basis for designing other devices, methods, or systems for carrying out the several purposes of the invention.

(0035) Further embodiments and objects of the invention comprise the following:

- Providing a GPS receiver interfaced with the WTT for an augmented or alternate means of geographic location determination;
- Providing a wireless local area network transceiver module for allowing wireless interconnection of multiple smoke alarms;
- Providing a strobe light for generating a visual alarm;
- Providing a radio frequency signal strength meter for measuring WTLS signals;
- Providing an AC/DC power management transformer system for primary and back-up power;

- Providing a disable button, for temporarily disabling the alarm activation signal;
- Providing a time delay control circuit and selector switch for temporarily delaying the alarm activation signal;
- Providing mobile or fixed mobile communication or computing device means to directly receive processed emergency identification and location data from said WTLS.

(0036) The Combination Smoke Alarm and Wireless Location Device has all the advantages of prior art smoke alarms, and none of the disadvantages, is easy to use, is easily manufactured and marketed, is of durable and reliable construction, is cost effective, and is economically available to the buying public. Merging the concepts of wireless E-911 location systems, mobile cellular telephones, and smoke alarm devices provides the general public and public safety authorities with an effective tool in the ongoing effort of protecting the public – by saving life and property from the ravages of fire.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a block diagram illustrating the components of the Combination Smoke Alarm and Wireless Location Device in the main device embodiment.

FIG. 2 is a block diagram illustrating the components of the Combination Smoke Alarm and Wireless Location Device in the alternate device embodiments.

FIG. 3 is a flow chart depicting the main method embodiment for automatically determining the geographic location of a smoke alarm and automatically dispatching emergency response resources utilizing WTLS.

FIG. 4 illustrates an example of a specific application of the preferred device and method embodiments in FIG. 1 and FIG. 3.

DETAILED DESCRIPTION OF THE EMBODIMENTS

(0037) The preferred device embodiment of the Combination Smoke Alarm and Wireless Location Device is shown as unit 102 in FIG. 1. Thereshown is unit 102, which is preferably confined within a housing that is configured to accommodate and optimize the operational performance of unit 102 components. Unit 102 is preferably fixed-mounted to a wall, ceiling, or other surface within the building structure in where smoke detection is provided.

(0038) Power supply 104, which provides primary power to unit 102, consists of AC

power, DC power, or both. Smoke sensor 106, consists of photoelectric or ionization sensors or both. Sensor alarm control circuit 108 is connected to smoke sensor 106, which generates alarm signals upon detecting a predetermined threshold of smoke. Connected thereto is audible alarm horn 110.

(0039) WTT module 112 is a cellular processor with integrated memory, similar in structure to WTT's contained in mobile cellular telephones. WTT module 112 provides a integrated memory containing preprogrammed or predetermined emergency identification data. WTT module 112 may be configured to transmit the emergency identification data signals via a control channel over a WTLS. WTT module 112 may also be configured with increased amplifier output for augmented location determination.

(0040) The preprogrammed or predetermined emergency identification data stored in WTT module 112 consists of a means for contacting a public 911 dispatch center or PSAP. Said emergency identification data configuration may be similar to the preprogrammed data stored in non-service initialized 911-only mobile cellular telephones, but may further include device identification data, and data or coding describing the nature of the fire emergency.

(0041) For example, said stored predetermined emergency identification data may consist of either the FCC's proposed consecutive number code "123-456-7890" with other device-specific data, or the Emergency Services Interconnection Forum proposed Annex C J-STD-036, which is a coded sequence of "911" followed by part of the wireless transceiver's Electronic Serial Number , or International Mobile Station Equipment Identity. The emergency identification data contained in said WTT module 112 memory may be preprogrammed at the factory-level, carrier-level, or at the point of sale. WTT module 112 may contain other preprogrammed emergency identification data for priority access to the WTLS.

(0042) During normal operation, unit 102 is powered by electrical power supply 104, and in a stand-by mode monitoring the protected environment for smoke. If smoke sensor 106 senses a predetermined threshold of smoke, sensor alarm control circuit 108 is set into alarm activation mode, triggering audible alarm horn 110, and WTT module 112 for as long as smoke-threat is present. Audible alarm horn 110 emits a continuous high-decibel tone to alert building occupants of a impending fire emergency, while WTT 112 "auto-dials" and transmits the stored emergency identification data signals over the E-911 upgraded WTLS to a PSAP, which dispatches emergency

response personnel to the location of unit 102.

(0043) An alternate device embodiment of the Combination Smoke Alarm and Wireless Location Device is shown as unit 202 in FIG. 2. Unit 202 is similar to in design to unit 102, but comprises additional features. Unit 202 is preferably confined within a housing that is configured to accommodate and optimize the operational performance of unit 202 components. Unit 202 is preferably fixed-mounted to a wall, ceiling, or other surface within the building structure where smoke detection is provided.

(0044) Next provided is power supply 204, which provides primary power to unit 202. Power supply 204 may consist of AC power, DC power or a AC/DC power management and transformer which provides primary AC power converted to DC power, and stored in a rechargeable DC battery in the event AC power is interrupted. Power LED 206 is a means for visually monitoring the AC or DC power of unit 202.

(0045) Next provided is smoke sensor 208, consisting of photoelectric or ionization sensors or both. Sensor alarm control circuit 210 is connected to smoke sensor 208, which generates alarm signals upon detecting a predetermined threshold of smoke.

(0046) Also provided and connected to sensor alarm control circuit 210 is alarm disable button 212, which allows a user to temporarily disable sensor alarm control circuit 210 for a predetermined time period. Alarm disable button 212 may include a default mode that renders it inoperable beyond a predetermined number of uses.

(0047) Further provided and connected to sensor alarm control circuit 210 is time delay control circuit 214 and time delay selector switch 216. Time delay selector switch 216 is a user-set switch allowing multiple predetermined time settings, which when set by a user, sets time delay control circuit 214, and sets sensor alarm control circuit 210 into a time delay operation mode. Time delay operation mode will delay the activation signal generated by sensor alarm control circuit 210 to other selected device components. Time delay operation mode also provides time for a user to manually press the disable button in the case of a false alarm.

(0048) Next provided and interconnected to sensor alarm control circuit 210 is WTT module 218, which provides a cellular processor with integrated memory, similar in structure to WTT's contained in mobile cellular telephones. WTT module 218 provides a integrated memory containing preprogrammed or predetermined emergency identification data. WTT module 218 may

be configured to transmit the emergency identification data signals via a control channel over a WTLS. WTT module 218 may also be configured with increased amplifier output for augmented location determination.

(0049) The preprogrammed or predetermined emergency identification data stored in WTT module 218 consists of a means for directly contacting a public 911 dispatch center or PSAP. Said emergency identification data configuration may be similar to the preprogrammed data stored in non-service initialized 911-only mobile cellular telephones, but may further include device identification data, and data or coding describing the nature of the fire emergency.

(0050) For example, said stored predetermined emergency identification data may consist of either the FCC's proposed consecutive number code "123-456-7890" with other device-specific data, or the Emergency Services Interconnection Forum proposed Annex C J-STD-036, which is a coded sequence of "911" followed by part of the wireless transceiver's Electronic Serial Number, or International Mobile Station Equipment Identity. The emergency identification data contained in the WTT module 218 memory may be preprogrammed at the factory-level, carrier-level, or at the point of sale. WTT module 218 may contain other preprogrammed emergency identification data for priority access to the WTLS.

(0051) Further provided and interconnected to WTT 218 is RF signal strength circuit 220 and indicator light 222, for measuring and monitoring the WTLS signal strength. RF signal strength circuit 220 and indicator light 222 allows the user to determine the sufficiency of WTLS signal strength to unit 202.

(0052) Next provided and interconnected to WTT 218 and sensor alarm control circuit 210 is GPS receiver module 224. GPS receiver module 224 is configured to provide primary or augmented geographic position determination for unit 202, and may be configured for assisted GPS operation.

(0053) Next provided and interconnected to sensor alarm control circuit 210 is audible alarm horn 226, which may be configured to emit a continuous high-decibel tone. Further interconnected to sensor alarm control circuit 210 strobe light 228, which may be configured for high candela output. Both audible alarm horn 226 and strobe light 228 may be ADA compliant for the hearing impaired. During normal operation, sensor alarm control circuit 210 activates audible alarm horn 226 and strobe light 228. During time-delay operation mode, sensor alarm control

circuit 210 causes audible alarm horn 226 to emit a intermittent high decibel tone for a duration of the pre-set time delay sequence.

(0054) Next provided and interconnected to sensor alarm control circuit 210 is wireless local area network ("WLAN") transceiver 230 and WLAN code selector 232. WLAN transceiver 230 is configured to transmit and receive short-range encoded activation signals between multiple Combination Smoke and Wireless Alarm Location Devices. WLAN code selector 232 includes a switch with multiple numeric code settings, which allows a user to set a code to limit the WLAN activation signal transmission to only other Combination Smoke Alarm and Wireless Location Devices with the same pre-set numeric code sequence.

(0055) FIG. 3 is a flowchart depicting the main method embodiment of the present invention. The Combination Smoke Alarm and Wireless Location Device, shown in FIG. 1 as unit 102, is utilized for illustrative purposes only. Other smoke alarm systems either now existing or not may be used in this or similar methods, or be similarly adapted and configured to operate in the method depicted in FIG. 3. The method described below comprises the above-described Combination Smoke Alarm and Wireless Location Device and a WTLS modified with the aforementioned E-911 wireless telecommunication location system architectures for automatically determining the geographic location of a unit 102, and automatically dispatching emergency response resources. The steps depicted in FIG. 3 should not be limited to the specifics of unit 102, and may incorporate other embodiments. Additionally, the steps described below in FIG. 3 will reference alternate steps comprising further embodiments.

(0056) The first step 302 is to equip a residential or commercial building with a Combination Smoke Alarm and Wireless Location Device (unit 102), which monitors the environment where smoke detection is provided. The residential or commercial building may be under construction, completed, vacant, or occupied. In step 304, the unit 102 senses a predetermined threshold of smoke, which activates said integrated WTT module. In an alternate step, a integrated GPS receiver module may also be activated. If the building is occupied, and if the building occupants are alerted by a audible or visual alarm, they will evacuate to safety.

(0057) Meanwhile, in step 306, the WTT module "auto-dials" and transmits the stored emergency identification data signals to the WTLS. If a GPS receiver module is integrated into the device, the acquired GPS location data would be transmitted along with the above mentioned

emergency identification data. In step 308, the WTLS processes said emergency identification data signals, determining the geographic location of unit 102. In step 310, the WTLS routes said emergency identification and location data to a PSAP, who further dispatches emergency response resources to the geographic location of the fire emergency. The PSAP may dispatch emergency response resources by various wireline or wireless communication means, including but not limited to wireline telephone, the internet, the above-mentioned WTLS, VHF/UHF radio, Enhanced Specialized Mobile Radio, SMS, MMS, or WLAN. In an alternate step, emergency response resources are equipped with mobile wireless communication and computing devices (e.g., Personal Digital Assistants, mobile cellular telephones, or mobile lap-top computers), utilizing the above wireless communication means, configured to directly receive from WTLS said processed emergency identification and location data, and respond to the geographic location of unit 102.

(0058) FIG. 4 illustrates an example of using the combined properties associated with the above-referenced FIG. 1 device and FIG. 3 method embodiments and WTLS architectures and patents incorporated herein. Illustrated in FIG. 4 is environment 400, containing residential building 402, which is equipped with Combination Smoke Alarm and Wireless Location Device 404.

(0059) Upon sensing a predetermined threshold of smoke 406 within residential building 402, Combination Smoke Alarm and Wireless Location Device 404 transmits predetermined emergency identification data signal 408 by means of WTLS 410. WTLS 410 processes and then routes predetermined emergency identification and location data 412 to PSAP 414, equipped with GIS display 416. GIS display 416 provides the geographic location of residential building 402 and Combination Smoke Alarm and Wireless Location Device 404, and dispatches emergency response resources 418 to the geographic location of residential building 402.